

**State of Oregon
Department of Environmental Quality**

Memorandum

Date: July 20, 2016
To: Eva DeMaria, US EPA
Through: Scott Manzano, DEQ Cleanup Section Manager
From: Rob Hood, Project Manager
Subject: Draft Source Control Decision
BNSF Willbridge Rail Yard
ECSI #3395

1.0 Introduction

This memorandum presents the basis for the Department of Environmental Quality source control decision for the Burlington Northern Santa Fe (BNSF) Willbridge Rail Yard site, located at 5814 NW Doane Avenue, Portland, Oregon.

BNSF conducted a Source Control Evaluation for the stormwater pathway at the site in accordance with the 2005 *EPA/DEQ Portland Harbor Joint Source Control Strategy*, also known as the JSCS, under a May 2002 Voluntary Cleanup Agreement between BNSF and the Oregon Department of Environmental Quality.

DEQ concludes from review of the Expanded Preliminary Assessment report, addenda and supporting documents that BNSF has controlled upland sources of contamination from current and past operations such that contaminant transport pathways at the site do not pose a significant current or future threat to the Willamette River.

2.0 Site Description and History

The site is currently owned and operated by BNSF as a rail car switching yard. As depicted in Figure 1, the 11.8-acre property is located about 2,000 feet inland of the southwest shore of the Willamette River at approximately river mile 8.2. The site is bounded to the north/northeast by the Conoco Philips bulk fuel facility and Paramount of Oregon Inc, and to the south/southwest by NW Saint Helens Road and Electrical Distributors Inc. The majority of the site is covered in ballast rock and gravel roads in support of rails and associated infrastructure. An administrative office and a paved parking area cover approximately 0.1 acre and are located on the western portion of the site, nearest to NW Doane Avenue.

The facility was initially developed in 1927 as a rail switching yard, and no previous uses are known. Rail switching activities generally consist of moving rail cars from one train to another on different tracks and/or changing the order of cars in a train on the same track. The site has not been used for locomotive fueling or service or for railcar maintenance since initial development. Occasionally, when fuel on an engine is too low to reach a fueling location, emergency "Direct to Locomotive" fueling is used, where fuel tanker trucks will transfer fuel to locomotive saddle tanks.

As depicted on Figure 2, the stormwater pathway from the BNSF Willbridge Yard is a complete, but minimal migration pathway. Stormwater infiltrates on the site, except for drainage from approximately 0.1 acre, which drains to a catch basin and then to the City of Portland stormwater system and is eventually conveyed to the Willamette River at City of Portland Outfall 19. Outfall 19 discharges into sediment area of potential concern 18.

As depicted in Figure 3, there are two stormwater lines beneath the site that convey off-site stormwater from roughly west to east and a line that conveys stormwater from roughly north to south along the eastern edge of the site between manhole locations marked as MH-11 and MH-SE. Ownership of these lines is unclear, but they primarily convey stormwater from NW Saint Helens Road and streams discharging from the hills of Forest Park. The lines accept site drainage from the paved 0.1 acre, connect to the storm sewer systems for Conoco Philips and Paramount and eventually discharge to City OF 19, as shown in Figure 4. Infiltration was improved in the east-central portion of the yard when two sections of perforated pipe were installed in 2012 to infiltrate standing water in a depression here, rather than into the stormwater conveyance system that crosses beneath the site.

3.0 Regulatory History

3.1 Stormwater

Stormwater from the paved 0.1 acre portion of the site was managed under a DEQ NPDES 1200-Z industrial stormwater general permit from 1999 to 2005. DEQ agreed to terminate the permit on February 24, 2005, because the activities within the small area that currently drains to the catch basin are not industrial activities subject to a 1200-Z permit.

3.2 Underground and Above Ground Storage Tanks

There are no underground storage tanks on site, and none are known to have been historically present.

A former 300-gallon above ground storage tank was reportedly located onsite to run a generator, which powered a compressor used to rapidly charge reservoirs for rail car air brakes. The tank was located on a concrete pad and no releases were identified. Sampling in the area confirmed there were no releases. No records on the installation or removal of this tank could be located by BNSF.

Another former 300-gallon above ground storage tank was identified on the site through a 1999 permit application. This tank was used for non-PCB heavy lubricating oil used in rail switch operation, but was decommissioned shortly thereafter without any known releases. Sampling in the area confirmed there were no releases.

3.3 Hazardous Substance Releases

On November 30, 1995, a release of an estimated 10-15 gallons of diesel fuel leaked from a fuel tank vent line on a derailed refrigerator rail car. Following the use of absorbents, two shallow soil samples were collected and analyzed for diesel-range hydrocarbons. Sample concentrations were 49 milligrams per kilogram and 880 mg/kg, both of which were below DEQ risk-based concentrations. No additional cleanup was performed. No other releases have been documented at the site.

4.0 Source Control Evaluation

Because the site is located within the uplands draining to the Portland Harbor Superfund study area, upland source control investigations were guided by the 2005 EPA/DEQ Joint Source Control Strategy.

The objective of a source control evaluation is to determine whether existing and potential sources of contamination at the site have been identified and if additional characterization or source control measures are needed.

When stormwater pipes are a potential pathway to mobilize contamination from the site to the river, these determinations generally rest upon demonstrating that site-related information provides sufficient support to make the following findings:

1. Existing and potential facility-related contaminant sources have been identified and characterized.
2. Contaminant sources were removed or are being controlled to the extent feasible.
3. Performance monitoring conducted after source control measures were implemented supports the conclusion that the measures are effective.
4. Adequate measures are in place to ensure source control and good stormwater management measures occur in the future (DEQ 2010).

Due to the distance from the river (more than a third of a mile), lack of releases at the site, relatively low concentrations of contaminants measured in soil at the margins of the site and lack of any upgradient plumes, groundwater under the site was determined not to be a threat to the river. Because groundwater may be preferentially transported from the site in or along stormwater conveyance pipes, dry weather flow was evaluated to ensure that any transported groundwater would not pose a threat to the river.

4.1 Contaminants of Potential Concern

Based on historical and current site operations and site sampling results the following contaminants are of potential concern at the site:

- Total Petroleum Hydrocarbons
- Polycyclic Aromatic Hydrocarbons
- Metals

4.2 Source Control Investigations

As detailed in the Pacific Crest *Source Control Evaluation* report, multiple instances of investigation, sampling, control measure implementation, remediation, and performance evaluation were undertaken at the site.

4.2.2 Catch Basin Sampling

As reported in the 2011 Expanded Preliminary Assessment report, solids from an assumed dry well behind the administration building were sampled and analyzed for a limited suite of analytes for decommissioning purposes. During initial cleanout, an outlet pipe was found, indicating that the drywell was actually a catch basin, labeled CB-44 on all figures, filled with solids. After sampling, the catch basin was cleaned out. Total petroleum hydrocarbons were detected in the solids sample in the diesel and heavy oil-range, but were below applicable DEQ risk-based concentrations. Of the eight metals analyzed, only lead was detected at a concentration (54 mg/kg) greater than JSCS screening levels, but below the regional background concentration of 79 mg/kg (DEQ 2013). Three individual polycyclic aromatic hydrocarbons were detected at concentrations modestly higher than JSCS screening levels: benzo(g,h,i)perylene (810 ug/kg), indeno(1,2,3-cd)pyrene (660 ug/kg), and pyrene (2,200 ug/kg). Catch basin solids data are included in Table 1.

Polychlorinated biphenyls, phthalates and additional metals were not analyzed in the samples collected from CB-44. However, in October 2003, the City of Portland accessed and sampled in-line solids at MH-SE on Figures 3 and 6, identified as location AAP831 in the City's OF-19 Basin report (City of Portland 2010). This manhole receives stormwater from the conveyance system along NW Saint Helens Road, the BNSF catch basin CB-44, and a portion of the stormwater from the Conoco Philips site. PCBs, pesticides, and phthalates and other SVOCs were not detected in the City solids sampling.

4.2.3 Stormwater Sampling

Also during preliminary assessment, stormwater samples were collected at stormwater manholes upstream and downstream of the site, labeled SW-1 through SW-4 on Figure 5, mainly to investigate whether any potential site contributions had notable effects on stormwater passing under the site. Two storm events were sampled in 2009 and 2010 and analyzed for total suspended solids, phthalates, and PCBs, the data from which is included in Table 2. TSS at both the upstream locations (SW-1 and SW-3) and one of the two downstream locations (SW-2) was significantly elevated. Phthalates were detected in upstream sample location SW-3 with minimal exceedances of the JSCS SLVs (bis(2-ethylhexyl)phthalate at 2.88 µg/L and di-n-octylphthalate at 2.21 µg/L) and were not detected in the downstream samples. Due to the elevated detection limits of PCBs (up to 0.47 ug/L) in these samples (Table 3), BNSF requested the lab reassess the results down to the method detection limits. At MDLs ranging from 0.037 ug/L to 0.067 ug/L, PCBs were not detected in the upstream or downstream samples.

Additional stormwater samples were collected in September 2014 and March 2015 and data are included in Table 2. The intent was to collect a first-flush sample, but due to access problems, sampling did not occur until about 30 hours into the event. Ten stormwater grab samples were analyzed for total gasoline and diesel, PAHs, PCB Aroclors, total and dissolved metals, and phthalates. Due to low flow, a limited size sample was dipped from standing water in CB-44 and only total and dissolved PAHs and total and dissolved metals were analyzed. Total gasoline and diesel were not detected. Cadmium, chromium, mercury, lead, selenium and silver were detected at or below respective JSCS SLVs. Total arsenic concentrations modestly exceeded the JSCS SLV in samples collected from all manholes. PAHs concentrations slightly exceeded respective JSCS SLVs in samples collected from South Manhole (chrysene and benzo[b]fluoranthene) and from the standing water in CB-44 (benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo(a)pyrene, indeno[1,2,3-cd]pyrene, and benzo[ghi]perylene). In all cases, concentrations exceeded the JSCS SLVs by less than an order of magnitude and results from the filtered samples were below the JSCS SLVs and below reporting limits, indicating association with solids. PCB Aroclors were not detected above the laboratory method reporting limit in any of the stormwater samples. All phthalate concentrations were below the JSCS SLVs with one exception (bis(2-ethylhexyl)phthalate at 3.6 µg/L).

4.2.4 Potential Groundwater Infiltration to the Stormwater Conveyance System

Elements of the evaluation of the potential for groundwater to be transported to the river via the stormwater conveyance system included:

1. Collecting soil samples from soil borings at six locations, including surface and soil-groundwater interface samples, for laboratory analysis;
2. Evaluation of the storm sewer system elevation in relation to groundwater levels; and
3. Evaluation of dry weather flow in the conveyance lines.

The boring locations were selected to coincide with the locations of the potential historical sources and are shown in Figure 5 with data reported in Table 3. Total petroleum hydrocarbons were not detected in any of the samples. PAHs and metals were either not detected or did not exceed JSCS SLVs or DEQ occupational risk-based concentrations, with the exception of arsenic (9.5 mg/kg and

23 mg/kg) and lead (36 mg/kg). Arsenic concentrations modestly exceeded regional background (DEQ 2013) and DEQ occupational RBC (DEQ 2015). The lead concentration is below the regional background (DEQ 2013) and the DEQ occupational RBC (DEQ 2015).

The elevation of groundwater at the site and nearby properties range between 6 to 9 feet below ground surface, depending on season and location. Figure 6 shows manhole locations and elevations, measured groundwater elevations at the site and vicinity and August 2012 observations of flow in pipes. Based on this information, it is apparent that groundwater is in contact with the catch basins/conveyance piping through much, if not all, of the year and there is dry weather flow through much of the conveyance system. A small amount of flow was observed in the north end of the site, from NW St. Helens Road at MH HWY30-1 and MH HWY30-2. BNSF concluded that this flow is sourced from the stormwater conveyance system along NW Saint Helens Road, which includes capture of three streams leaving Forest Park. Flow conditions could not be observed in MH-11 because it was covered by asphalt. No flow was observed in MH-9, indicating there is no dry weather flow coming from that portion of the Conoco Philips system. On the southern end of the site, there was no flow observed in MH HWY30-3 or Culvert HWY30. Flow was again observed in both the South MH and further down the line in MH SE. While MH-11 could not be observed, it is likely that the flow observed entering the site from the north end (MH HWY30-1 and MH HWY30-2) is flowing through MH-11, and exiting the site at the south end (MH SE), and continuing on to the OF-19 system. Because qualitative flow rates were similar entering and leaving pipes under the site, BNSF attributed dry weather flows to conveyance capture of the streams from Forest Park.

Additional dry weather flow observations and sampling were conducted in 2014, focused on the potential for groundwater beneath Willbridge Yard to infiltrate the conveyance system and adversely affect dry weather drainage. These objectives were met by: observing dry weather flow in upstream downstream manholes shown on Figure 7; and, collecting dry weather flow grab samples from: 1) the influent to South MH (downstream); 2) the influent to MH-11 (upstream); and 3) the bottom of MH-HWY30-1 (upstream). The samples were analyzed for TPH gasoline and diesel ranges, PAHs, PCBs, RCRA 8 metals, and phthalates. Similar to 2012 observations of dry weather flows, upstream and downstream flows were generally consistent (MW-11 approximately 0.2 gpm, South MH approximately 0.4 gpm, and MH SE unmeasured rate due to minimal flow at bottom of manhole), indicating no significant contribution from the yard in between. Analytical data, presented in Table 4, showed similar concentrations in comparing upstream and downstream manhole samples, indicating no significant contribution from the yard in between.

4.3 Lines of Evidence Evaluation

As shown on Figure 4, the great majority of rain falling on the site infiltrates. Stormwater contributions are insignificant, in both volume and contaminant concentrations, from the 0.1 acre that discharges to the conveyance system that eventually discharges to Portland Harbor through City of Portland outfall 19.

Stormwater and catch basin solids sampling results that exceeded the JSCS initial upland source control screening level values and applicable background concentrations were compared to DEQ charts from *Appendix E: Tools for Evaluating Stormwater Data*, which was updated 2015. This tool was created by using contaminant concentration data from many of the stormwater and stormwater solids samples collected at Portland Harbor-area heavy industrial sites. This data was used to create a series of charts that plot rank-order samples against contaminant concentrations, and are used to identify contaminant concentrations in samples that are atypically elevated. Concentrations falling within the upper/steeper portion of the curve are an indication that uncontrolled contaminant sources may be present at the site and that additional evaluation or source control measures may be needed. Concentrations that fall on the

lower/flatter portion of the curve suggest that stormwater is not being unusually impacted by contaminants at the site, and while concentrations may exceed the risk-based SLVs or stormwater PRGs, they are within the range found in stormwater or solids from active industrial sites in Portland Harbor.

Only three PAHs were detected in catch basin 44 solids at concentrations that modestly exceeded JSCS SLVs, but total PAHs fall on the lower, flatter portion of the rank-order curve, indicating that additional source control measures are not warranted.

Stormwater and dry weather flow sampling at upstream and downstream manholes reveal comparable concentrations of contaminants, when detected. In addition, with the exception of arsenic and cadmium in dry weather flows, some concentrations of detected contaminants exceeding PRGs (arsenic and bis(2-ethylhexyl)phthalate) or JSCS SLVs (cadmium, lead, and a few individual PAHs) were below the flat portion of the rank-order curves. These sample points do not directly measure concentrations of site contributions through stormwater discharges or infiltration to groundwater, but the relatively lower concentrations of contaminants and comparability at up and downstream locations indicates that site contributions are insignificant.

While an understanding of the configuration and ownership of stormlines running under the site has not been definitively established, illicit connections to the system are unlikely. As explained in the December 2014 cover letter to BNSF's submittal of the third addendum to the XPA, this is because disruption of rail operations to allow installation of underground lines after initial site development in the 1940s is not likely to have occurred and would have been unnecessary given the ready infiltration of stormwater at the site through sandy dredged-fill and ballast rock.

The limited historical releases on the site, minimal volume of stormwater that is conveyed from 0.1 acre of the site, relatively low concentrations of the contaminants measured in shallow soil samples and catch basins solids and lack of appreciable groundwater contributions to stormwater conveyances suggest that additional source control measures at the site are not warranted.

4.4 Source Control Decision

Based on review of the file, DEQ concludes that this upland site is adequately characterized to support a source control decision and source control measures are not warranted. The property does not appear to be a current or reasonably likely future source of contamination to the Willamette River, provided that releases continue to be prevented and infiltration of the majority of site stormwater continues.

5.0 References

AECOM. September 2011. Expanded Preliminary Assessment and Source Control Evaluation BNSF Willbridge Yard.

City of Portland. June 2010. Source Investigation Update Report City of Portland Outfall Basin 19.

DEQ. 2009 (updated 2010 and 2015). Guidance for Evaluating the Stormwater Pathway at Upland Sites. <http://www.deq.state.or.us/lq/cu/stmwtrguidance.htm>.

DEQ. March 2013. Development of Oregon Background Metals Concentrations. <http://www.deq.state.or.us/lq/pubs/docs/cu/DebORbackgroundMetal.pdf>.

DEQ. November 2015. Table of Risk-Based Concentrations from DEQ's Risk-Based Decision Making Guidance. <http://www.deq.state.or.us/lq/pubs/docs/RBDMTable.pdf>.

Integral. December 2012. Addendum to the Expanded Preliminary Assessment and Source Control Evaluation, BNSF Willbridge Yard, Portland, Oregon.

Integral. August 2013. Correspondence (e-mail to S. Rapp, Oregon Department of Environmental Quality, Portland, OR, dated August 5, 2013, regarding BNSF Willbridge Yard SCE response to DEQ's comments on XPA/SCE addendum, from A. Clark, Integral Consulting Inc.).

Integral. January 2014. Addendum 2 to the Expanded Preliminary Assessment and Source Control Evaluation 2013 Soil Sampling Results, BNSF Willbridge Yard, Portland, Oregon.

Integral. December 2014. Addendum 3 to the Expanded Preliminary Assessment and Source Control Evaluation, 2014 Dry Weather Storm Drain Sampling Results, BNSF Willbridge Yard, Portland, Oregon.

Integral. August 2015. Addendum 4 to the Expanded Preliminary Assessment and Source Control Evaluation, 2015 Dry Weather Storm Drain Sampling Results, BNSF Willbridge Yard, Portland, Oregon.

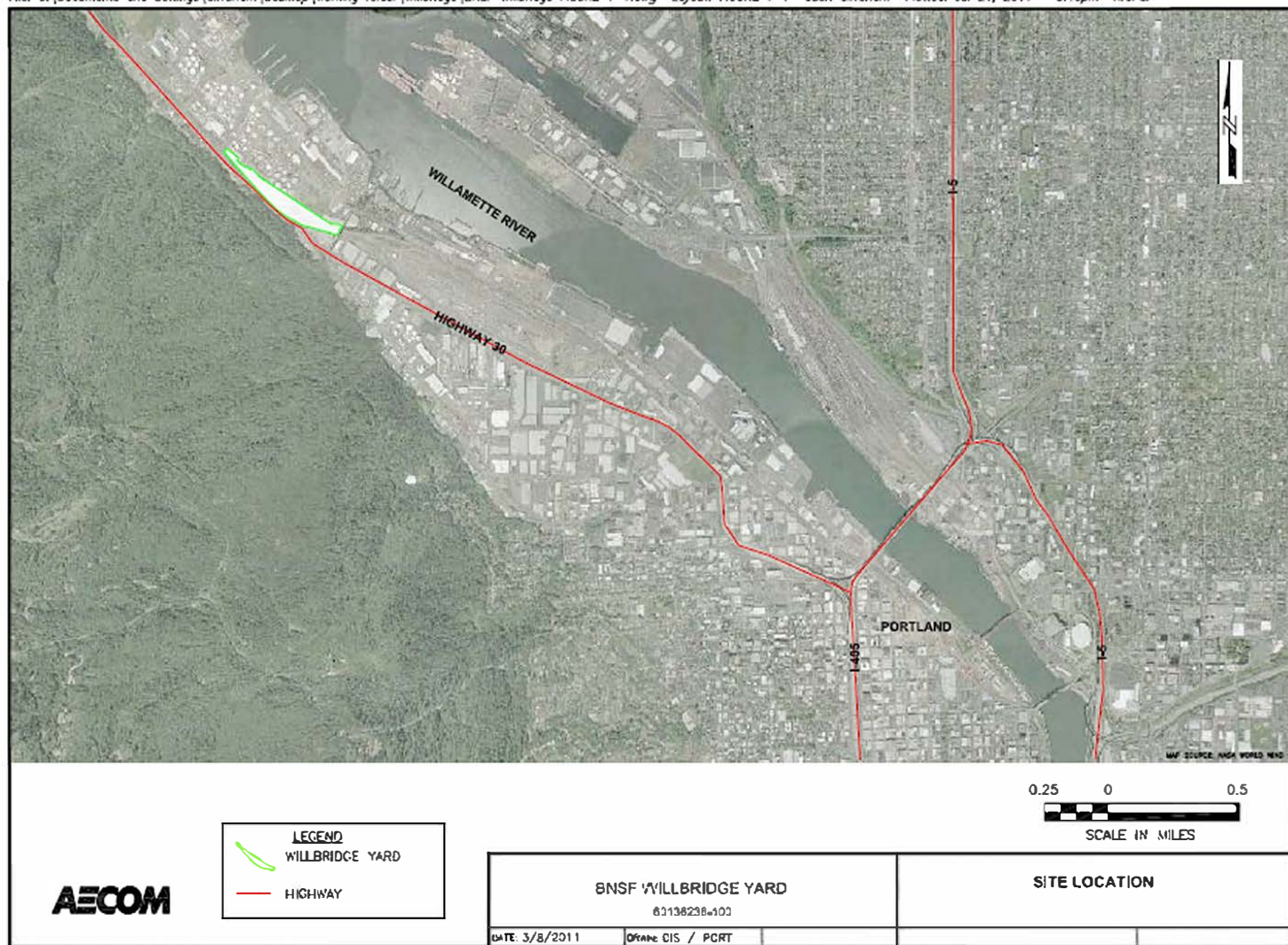
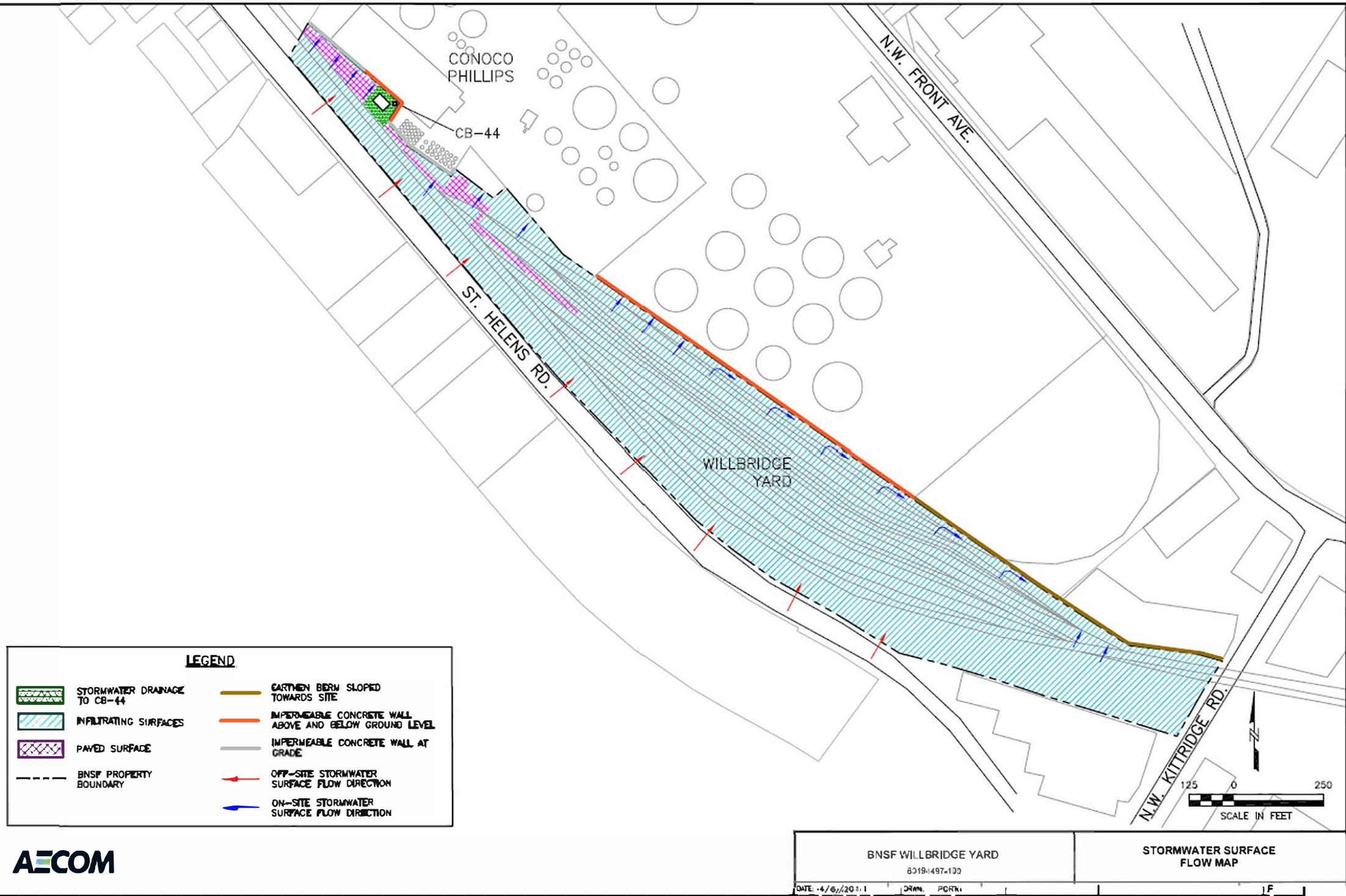
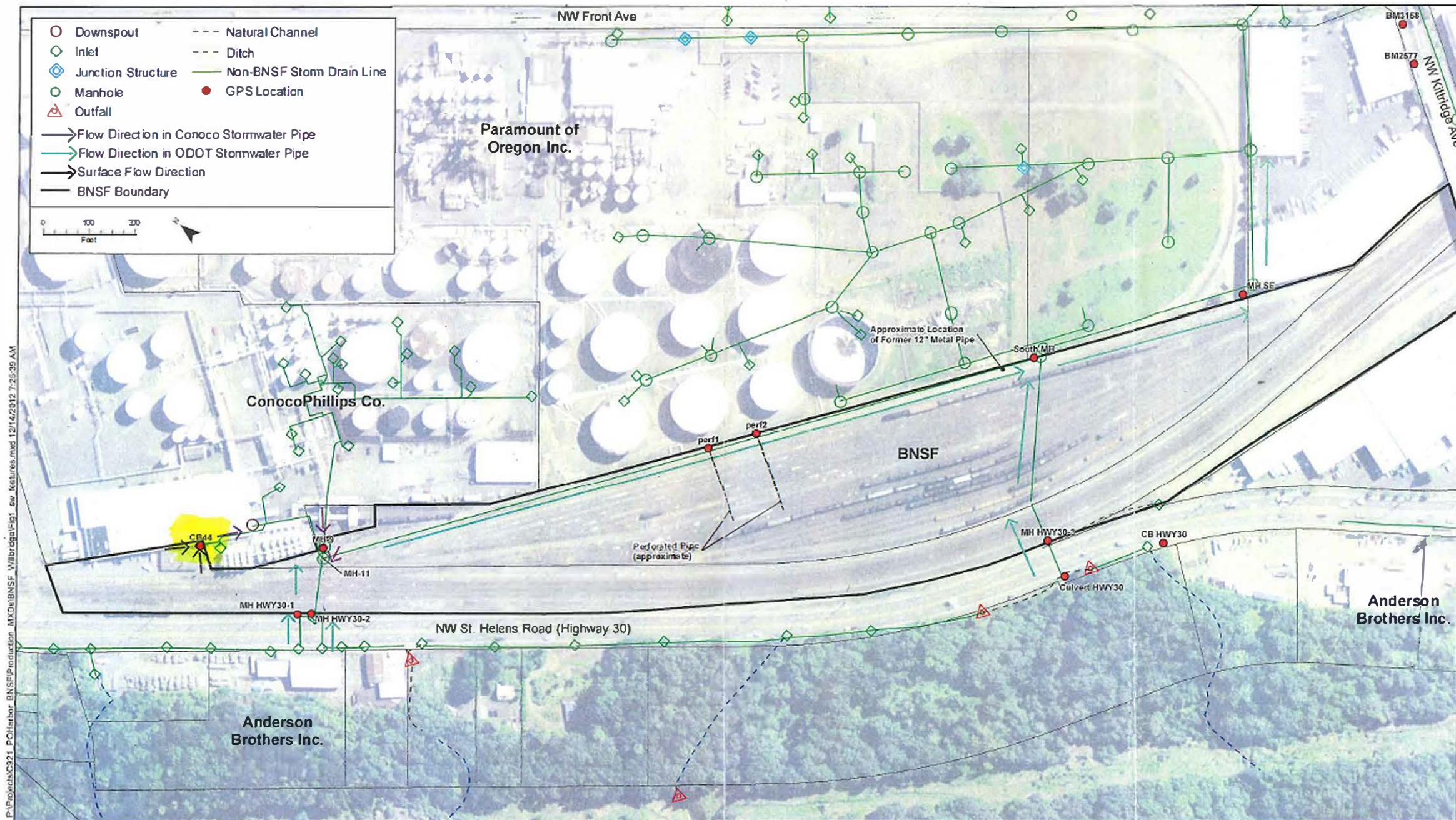


FIGURE 1



AECOM

Figure 2



integral

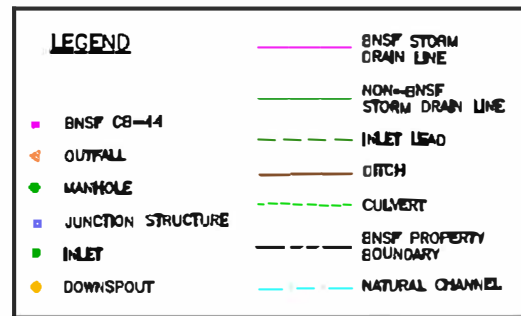
GPS Points collected on 8/30/2012 using Trimble GeoX-H
 MH = Manhole
 HWY30 = Highway 30
 BM = Benchmark
 CB = Catch Basin
 Per = Perforated Pipe

Notes:
 According to integral correspondence on 9/7/12 with Tim H. Lambert (BNSF employee), the two perforated pipes were installed in early 2012. The pipes were installed to drain stormwater that temporarily accumulates in a very small area between the tracks. Pipes extend from a large ditch to between tracks 8 and 9. A second outfall is shown. According to integral correspondence on 9/7/12 with Tim H. Lambert (BNSF employee), the former 12" metal pipe was plugged over 20 years ago and no longer provides drainage to the South Mt.

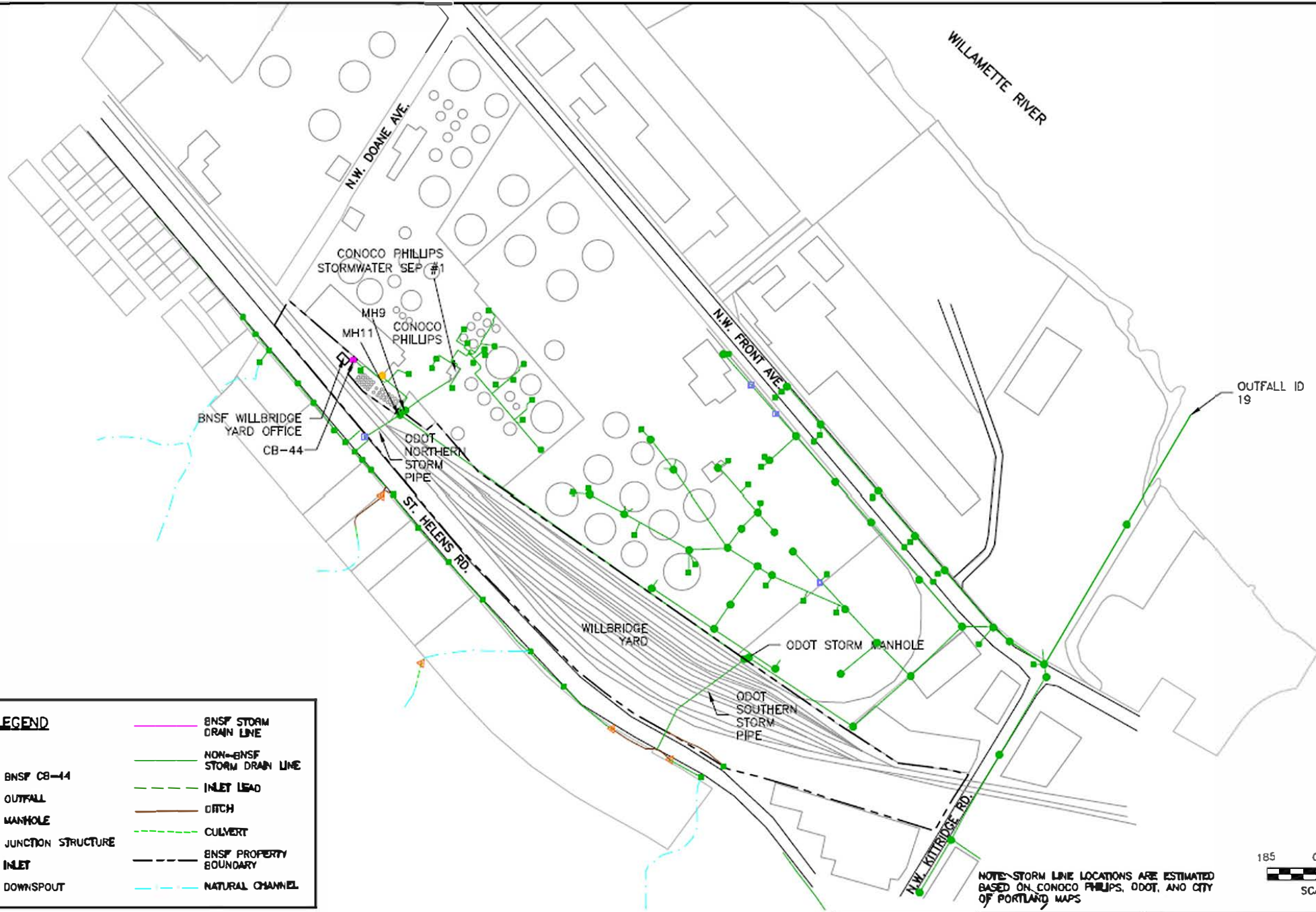
2012 data from BNSF Wilbridge site well conducted on August 30, 2012.
 Pipelines and stormwater features from AECOM 2011, Aerial Source: ESRI/Alex (2009)

Figure 3

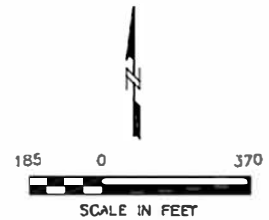
Stormwater Features
 Wilbridge Site Reconnaissance (August 30, 2012)



AECOM



NOTE: STORM LINE LOCATIONS ARE ESTIMATED BASED ON CONOCO PHILLIPS, ODOT, AND CITY OF PORTLAND MAPS



<p>BNSF WILLBRIDGE YARD 00194497-100</p>	<p>AREA STORMWATER NETWORK MAP</p>
<p>DATE 4/12/2011 10:06 PM</p>	

Figure 4

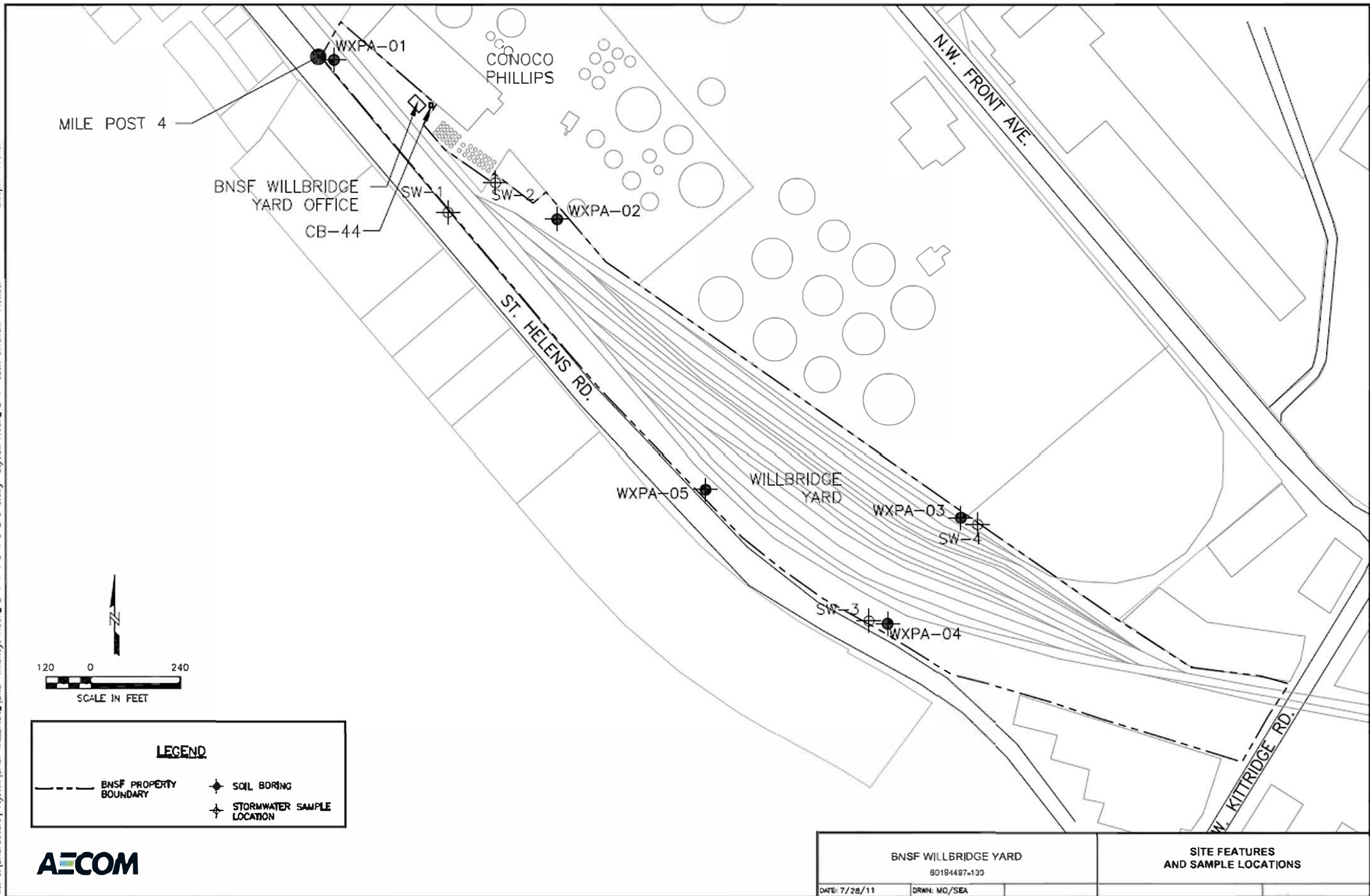


FIGURE 5

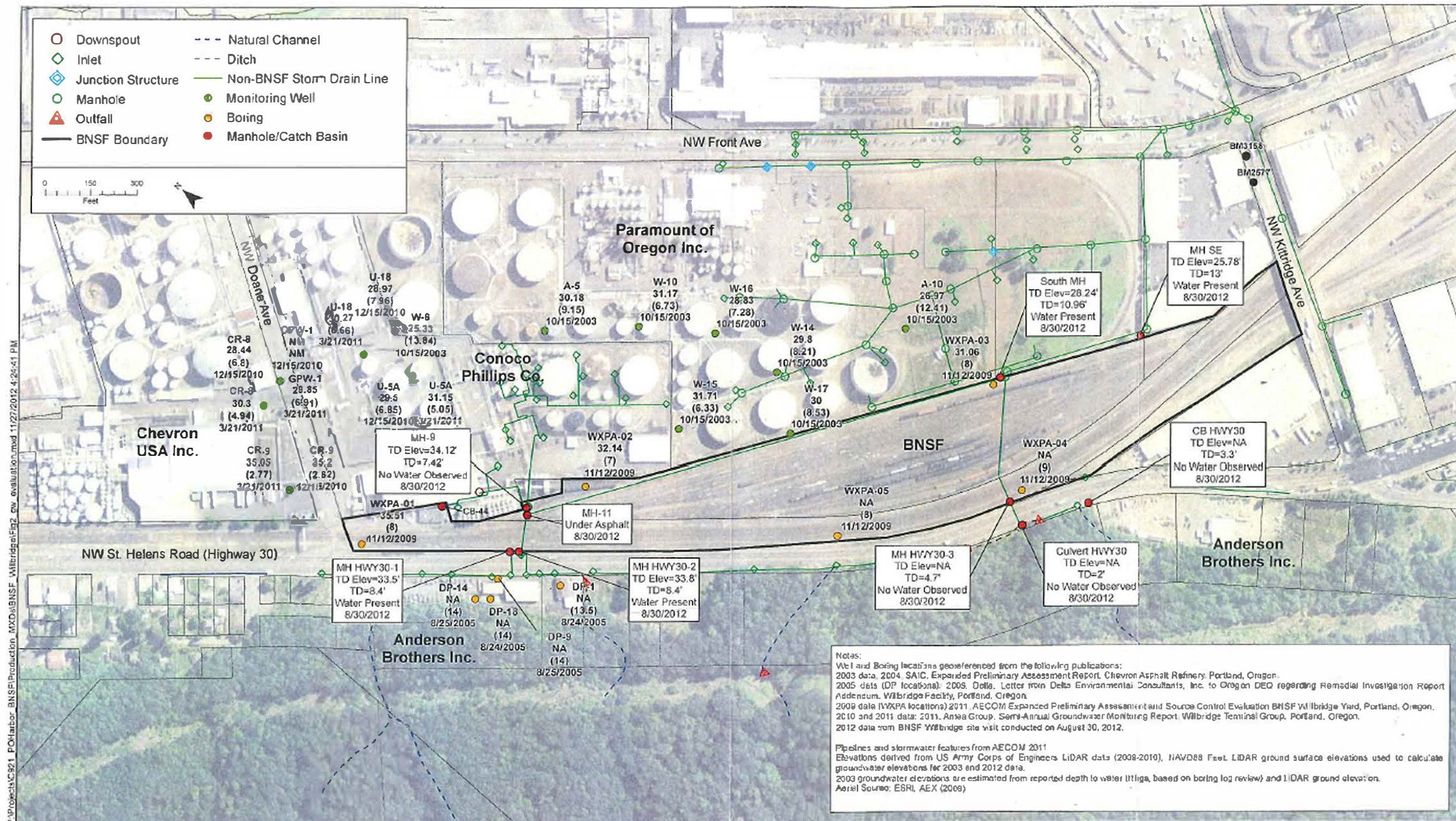


Figure 6

Groundwater Level and Stormwater Feature Evaluation

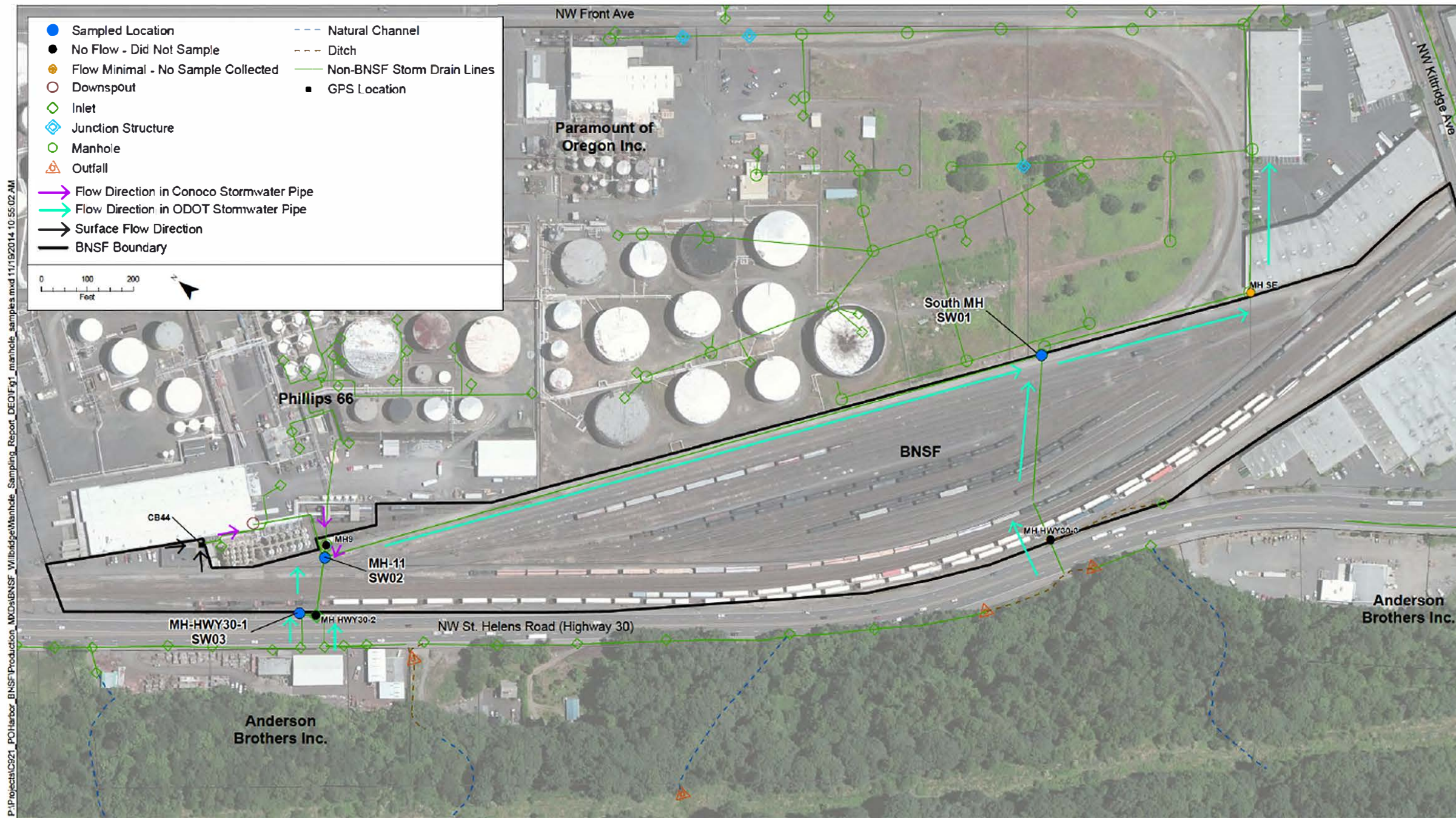


Figure 7
Dry Weather Observation and Sampling Locations
BNSF Willbridge Yard

Table 1 Catch Basin Sediment Chemical Data

Chemical Type			TPH	SVOCs								
Chemical Name			#2 Diesel (C10-C24)	Motor Oil (>C24-C36)	1,2-Benzphenanthracene	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[a]anthracene	Benzo[a]pyrene
Unit			mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
JSCS Screening Level			NS	NS	1,290	NS	200	300	200	845	1,050	1,450
Direct Contact Screening Level			2,500	5,000	NS	NS	NS	19,000,000	NL	93,000,000	21,000	2,100
Location ID	Depth (ft bgs)	Sample Date										
CB-44	Catch basin	11/12/2009	< 31	230	910	< 33	< 33	49	54	240	690	1000

Chemical Type			SVOCs									
Chemical Name			Benzo [b]fluoranthene	Benzo[g,h,i]perylene	Benzo [k]fluoranthene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	Naphthalene	Phenanthrene	Pyrene
Unit			µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
JSCS Screening Level			NA	300	13,000	1,300	2,230	536	100	561	1,170	1,520
Direct Contact Screening Level			21,000	NS	210,000	NS	8,900,000	12,000,000	21,000	580,000	NS	6,700,000
Location ID	Depth (ft bgs)	Sample Date										
CB-44	Catch basin	11/12/2009	1,300	810	420	150	1,800	44	660	48	730	2,200

Chemical Type			Metals							
Chemical Name			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Unit			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		JSCS Screening Level	7	NA	1	111	17	0.07	2	5
		Direct Contact Screening Level	13	60,000	>Max	NS	800	93	5,100	1,500
Location ID	Depth (ft bgs)	Sample Date								
CB-44	Catch basin	11/12/2009	4.5	79	< 0.26	16	58	< 0.025	< 0.66	< 0.26

Notes:

BGS Below ground surface

Bold Detected Value

JSCS Portland Harbor Joint Source Control Strategy

NS No screening level

BLUE Value detected at or above the JSCS screening level

< non-detect value at the reporting limit

Table 2: Stormwater Sampling Results (2009-2015)

JSCS Screening Levels ^a			MH-HWY30-2 (SW-1) upstream	MH-HWY30-2 (SW-1a) upstream	MH-11 (SW-2) downstream	MH-HWY30-3 (SW-3) upstream	South MH (SW-4) downstream	South MH from MH 11 (SW01) downstream	South MH from MH 11 (SW09) downstream	South MH from HWY30-3 (SW10) downstream	MH- HWY30-3A (SW08) upstream	MH-HWY30- 3B (SW07) upstream
			11/12/2009	11/18/2010	11/18/2010	11/12/2009	11/12/2009	9/16/2014	3/16/2015	3/16/2015	3/16/2015	3/16/2015
Analyte	Value (µg/L.)	Note	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PAHs ^b (8270D SIM)												
Naphthalene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.015	0.0038 U	0.0041 U	0.0040 U
1-Methylnaphthalene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.0049 J	0.0031 U	0.0034 U	0.0033 J
2-Methylnaphthalene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.0032 U	0.0031 U	0.0034 U	0.0033 U
Acenaphthylene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.0032 U	0.0031 U	0.0034 U	0.0033 U
Acenaphthene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.0032 U	0.0031 U	0.0034 U	0.0033 U
Fluorene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.0032 U	0.0031 U	0.0034 U	0.0033 U
Phenanthrene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.0077 U	0.0073 U	0.0042 U	0.0061 U
Anthracene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.026	0.0038 U	0.0034 U	0.0033 U
Fluoranthene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.016	0.0052 J	0.0034 U	0.0071 J
Pyrene	0.2	MCL	NA	NA	NA	NA	NA	0.069 U	0.018	0.0048 J	0.0034 U	0.0065 J
Benzo(a)anthracene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.011	0.011	0.0031 U	0.0034 U	0.0041 J
Chrysene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.013	0.02	0.0036 J	0.0034 U	0.0053 J
Benzo(b)fluoranthene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.025	0.026	0.004 J	0.0034 U	0.0061 J
Benzo(k)fluoranthene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.0078	0.0084 J	0.0031 UJ	0.0034 UJ	0.0033 UJ
Benzo(a)pyrene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.016	0.0065 J	0.0031 U	0.0034 U	0.0033 U
Indeno(1,2,3-cd)pyrene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.015	0.013	0.0031 U	0.0034 U	0.0041 J
Dibenz(a,h)anthracene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.0069 U	0.0032 U	0.0031 U	0.0034 U	0.0033 U
Benzo(g,h,i)perylene	0.018	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.069 U	0.011	0.0031 U	0.0034 U	0.004 J
Total PAHs	--	--	NA	NA	NA	NA	NA	0.0878	0.1758	0.0176	0	0.0405
Metals ^c (6020)												
Arsenic, Total	0.045	Tap Water PRG	NA	NA	NA	NA	NA	63	1.2	0.3	0.33	0.3
Arsenic, Dissolved (field filtered)	--	--	NA	NA	NA	NA	NA	11	0.98	0.21	0.23	0.25
Barium, Total	NA	NA	NA	NA	NA	NA	NA	270	26	27	26	28
Barium, Dissolved (field filtered)	NA	NA	NA	NA	NA	NA	NA	29	20	22	22	22
Cadmium, Total	--	--	NA	NA	NA	NA	NA	0.75	0.05 U	0.05 U	0.053 J	0.05 U

Table 2: Stormwater Sampling Results (2009-2015)

August 2015

Analyte	JSCS Screening Levels ³		MH-HWY30-2 (SW-1) upstream	MH-HWY30-2 (SW-1a) upstream	MH-11 (SW-2) downstream	MH-HWY30-3 (SW-3) upstream	South MH (SW-4) downstream	South MH from MH 11 (SW01) downstream	South MH from MH 11 (SW09) downstream	South MH from HWY30-3 (SW10) downstream	MH- HWY30-3A (SW08) upstream	MH-HWY30- 3B (SW07) upstream
	Value (µg/L)		11/12/2009	11/18/2010	11/18/2010	11/12/2009	11/12/2009	9/18/2014	3/18/2015	3/18/2015	3/18/2015	3/18/2015
	Note	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Cadmium, Dissolved (field filtered)	0.094	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.16	0.05 U	0.05 U	0.05 U	0.05 U
Chromium, Total	100	MCL	NA	NA	NA	NA	NA	2.1	1.5	1.3	1.3	1.7
Chromium, Dissolved (field filtered)	NA	NA	NA	NA	NA	NA	NA	0.44 J	0.64	0.63	0.63	0.66
Lead, Total	—	—	NA	NA	NA	NA	NA	4.2	1.3	1	1.1	1.2 B
Lead, Dissolved (field filtered)	0.54	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.85	0.41	0.39	0.43	0.54
Selenium, Total	5	—	NA	NA	NA	NA	NA	0.34 J	0.3 U	0.3 U	0.3 U	0.3 U
Selenium, Dissolved (field filtered)	—	EPA's 2004 NRQWC (organism only)	NA	NA	NA	NA	NA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Silver, Total	0.12	DEQ's 2004 AWQC (chronic)	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Silver, Dissolved (field filtered)	—	—	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Mercury, Total (7470A)	—	—	NA	NA	NA	NA	NA	0.088 U	0.041 U	0.041 U	0.041 U	0.041 U
Mercury, Dissolved (7470A, field filtered)	0.77	EPA's 2004 NRQWC (chronic)	NA	NA	NA	NA	NA	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U
TPH												
Gasoline Range (NWTPH-GX)	NA	NA	NA	NA	NA	NA	NA	10 U	27 U	27 U	27 U	27 U
Diesel Range (#2 C10-C24) (NWTPH-DX)	NA	NA	NA	NA	NA	NA	NA	240 J	100 UJ	82 UJ	95 UJ	91 UJ
Motor Oil (>C24-C36) (NWTPH-DX)	NA	NA	NA	NA	NA	NA	NA	270 J	37 U	33 U	32 U	31 U
PCBs⁶ (8082A)												
Aroclor® 1018	0.96	Tap Water PRG	NA	NA	NA	NA	NA	0.0051 U	0.0049 U	0.0047 U	0.0053 U	0.0051 U
Aroclor® 1221	0.034	Tap Water PRG	0.47 U	0.0971 U	0.0952 U	0.47 U	0.47 U	0.007 U	0.0068 U	0.0065 U	0.0073 U	0.0071 U
Aroclor® 1232	0.034	Tap Water PRG	NA	NA	NA	NA	NA	0.0047 U	0.0045 U	0.0043 U	0.0048 U	0.0047 U
Aroclor® 1242	0.034	Tap Water PRG	0.47 U	0.194 U	0.190 U	0.47 U	0.47 U	0.0047 U	0.0045 U	0.0043 U	0.0048 U	0.0047 U
Aroclor® 1248	0.034	Tap Water PRG	0.47 U	0.0971 U	0.0952 U	0.47 U	0.47 U	0.0081 U	0.0077 U	0.0074 U	0.0084 U	0.0081 U
Aroclor® 1254	0.033	Oak Ridge National Laboratory's (Tier II SCV)	0.47 U	0.0971 U	0.0952 U	0.47 U	0.47 U	0.0050 U	0.0048 U	0.0046 U	0.0052 U	0.0050 U
Aroclor® 1260	0.034	Tap Water PRG	0.47 U	0.0971 U	0.0952 U	0.47 U	0.47 U	0.0044 U	0.0042 U	0.0041 U	0.0046 U	0.0044 U
Total PCBs	0.000064	Portland Harbor specific fish consumption rate	NA	NA	NA	NA	NA	0.0081 U	0.0077 U	0.0074 U	0.0084 U	0.0081 U

Table 2: Stormwater Sampling Results (2009-2015)

Analyte	JSCS Screening Levels ^a		MH-HWY30-2 (SW-1) upstream	MH-HWY30-2 (SW-1a) upstream	MH-11 (SW-2) downstream	MH-HWY30-3 (SW-3) upstream	South MH (SW-4) downstream	South MH from MH 11 (SW01) downstream	South MH from MH 11 (SW09) downstream	South MH from HWY30-3 (SW10) downstream	MH- HWY30-3A (SW06) upstream	MH-HWY30- 3B (SW07) upstream
	Value (µg/l.)	Note	11/12/2009	11/18/2010	11/18/2010	11/12/2009	11/12/2009	9/18/2014	3/18/2015	3/18/2015	3/18/2015	3/18/2015
Phthalates (82700)												
Butylbenzylphthalate	3.0	DEQ's 2004 AWQC (chronic)	1.89 U	0.952 U	0.952 U	1.89 U	0.943 U	0.17 J	0.18 U	0.25 U	0.45	0.13 U
Bis(2-ethylhexyl)phthalate	2.2	EPA's 2004 NRQWC (organism only)	1.89 U	0.952 U	0.952 U	2.88	0.943 U	2.1 UJ	0.63 U	0.62 U	0.67 U	0.66 U
Diethylphthalate	3.0	DEQ's 2004 AWQC (chronic)	1.89 U	0.952 U	0.952 U	1.89 U	0.943 U	0.064 UJ	0.054 U	0.052 U	0.057 U	0.056 U
Dimethylphthalate	3.0	DEQ's 2004 AWQC (chronic)	1.89 U	0.952 U	0.952 U	1.89 U	0.943 U	0.064 UJ	0.054 U	0.052 U	0.057 U	0.056 U
Di-n-butylphthalate	3.0	DEQ's 2004 AWQC (chronic)	1.89 U	0.952 U	0.952 U	1.89 U	0.943 U	0.083 UJ	0.070 U	0.068 U	0.074 U	0.072 U
Di-n-octylphthalate	3.0	DEQ's 2004 AWQC (chronic)	9.43 U	0.952 U	0.952 U	2.21	0.843 U	0.11 UJ	0.097 U	0.094 U	0.10 U	0.10 U

Table 2: Stormwater Sampling Results (2009-2015)

Analyte	JSCS Screening Levels ^a		MH-SE from	MH-11 from	MH-11 from	MH-11 from	MH-	MH-	MH-HWY30-	CB-44	Dissolved
			South MH	Phillips66/CB44	HWY30-2	HWY30-2	HWY30-1	HWY30-1	2 (SW12)	(SW13)	
	(SW08)	(SW02) downstream	(SW04)	(SW05)	(SW03)	(SW11)	upstream	downstream	downstream		
	Value	Note	3/16/2015	9/16/2014	3/16/2015	3/16/2015	9/16/2014	3/16/2015	3/16/2015	3/16/2015	Result
	(µg/L.)		Result	Result	Result	Result	Result	Result	Result	Result	Result
PAHs ^b (8270D SIM)											
Naphthalene	0.2	MCL	0.021	0.062 U	0.016	0.022	0.057 U	0.0040 U	0.025	0.011	0.0097 J
1-Methylnaphthalene	0.2	MCL	0.0034 U	0.062 U	0.0038 J	0.0034 J	0.057 U	0.0033 U	0.0037 U	0.0034 U	0.0044 J
2-Methylnaphthalene	0.2	MCL	0.0034 U	0.062 U	0.0033 U	0.0033 U	0.057 U	0.0033 U	0.012 J	0.0038 J	0.0033 U
Acenaphthylene	0.2	MCL	0.0034 U	0.062 U	0.0033 U	0.0033 U	0.057 U	0.0033 U	0.0051 J	0.0034 U	0.0033 U
Acenaphthene	0.2	MCL	0.0034 U	0.062 U	0.0037 J	0.0046 J	0.057 U	0.0033 U	0.0037 J	0.0034 U	0.11
Fluorene	0.2	MCL	0.0034 U	0.062 U	0.0033 U	0.0042 J	0.057 U	0.0033 U	0.0037 U	0.0034 U	0.0033 U
Phenanthrene	0.2	MCL	0.0056 U	0.062 U	0.0067 U	0.01 U	0.057 U	0.0058 U	0.0099 U	0.045	0.0033 U
Anthracene	0.2	MCL	0.015	0.062 U	0.01 U	0.014	0.057 U	0.0033 U	0.0037 U	0.027	0.015
Fluoranthene	0.2	MCL	0.012	0.062 U	0.0099 J	0.013	0.057 U	0.0062 J	0.005 J	0.11	0.0035 J
Pyrene	0.2	MCL	0.014	0.062 U	0.011	0.013	0.057 U	0.0067 J	0.0047 J	0.1	0.0033 U
Benzo(a)anthracene	0.018	EPA's 2004 NRQWC (organism only)	0.0074 J	0.0062 U	0.0062 J	0.0067 J	0.0057 U	0.0033 U	0.0037 U	0.035	0.0033 U
Chrysene	0.018	EPA's 2004 NRQWC (organism only)	0.013	0.0062 U	0.0095 J	0.011	0.0057 U	0.0039 J	0.0037 U	0.07	0.0033 U
Benzo(b)fluoranthene	0.018	EPA's 2004 NRQWC (organism only)	0.016	0.0062 U	0.014	0.015	0.0069	0.0036 J	0.0037 U	0.069	0.0033 U
Benzo(k)fluoranthene	0.018	EPA's 2004 NRQWC (organism only)	0.0049 J	0.0062 U	0.0048 J	0.0053 J	0.0057 U	0.0033 UJ	0.0037 UJ	0.02 J	0.0033 U
Benzo(a)pyrene	0.018	EPA's 2004 NRQWC (organism only)	0.0039 J	0.0062 U	0.0033 U	0.0041 J	0.0057 U	0.0033 U	0.0037 U	0.024	0.0033 U
Indeno(1,2,3-cd)pyrene	0.018	EPA's 2004 NRQWC (organism only)	0.0076 J	0.0062 U	0.0081 J	0.0085 J	0.0057 U	0.0033 U	0.0037 U	0.042	0.0033 U
Dibenz(a,h)anthracene	0.018	EPA's 2004 NRQWC (organism only)	0.0034 U	0.0062 U	0.0033 U	0.0033 U	0.0057 U	0.0033 U	0.0037 U	0.0081 J	0.0033 U
Benzo(g,h,i)perylene	0.018	EPA's 2004 NRQWC (organism only)	0.0063 J	0.062 U	0.0079 J	0.0074 J	0.057 U	0.0033 U	0.0037 U	0.039	0.0033 U
Total PAHs	--	--	0.1211	0.062 U	0.0949	0.1322	0.0069	0.0204	0.0555	0.6039	0.1426
Metals ^c (6020)											
Arsenic, Total	0.045	Tap Water PRG	0.72	1.1	0.65	0.57	54	0.43	0.29	2	NA
Arsenic, Dissolved (field filtered)	--	--	0.59	0.51	0.39	0.48	10	0.16	0.15	0.27	NA
Barium, Total	NA	NA	26	18	29	25	440	27	24	39	NA
Barium, Dissolved (field filtered)	NA	NA	20	11	16	19	150	17	16	6.5	NA
Cadmium, Total	--	--	0.05 U	0.13	0.089 J	0.05 U	1.6	0.07 J	0.05 U	0.19	NA

Table 2: Stormwater Sampling Results (2009-2015)

Analyte	JSCS Screening Levels ^a		MH-SE from South MH (SW08) downstream 3/16/2015	MH-11 from Phillips86/CB44 (SW02) downstream 9/18/2014	MH-11 from HWY30-2 (SW04) downstream 3/16/2015	MH-11 from HWY30-2. Duplicate (SW05) downstream 3/16/2015	MH- HWY30-1 (SW03) upstream 9/16/2014	MH- HWY30-1 (SW11) upstream 3/16/2015	MH-HWY30- 2 (SW12) upstream 3/16/2015	CB-44 (SW13) downstream 3/16/2015	Dissolved Result
	Value (µg/L)	Note	Result	Result	Result	Result	Result	Result	Result	Result	
Cadmium, Dissolved (field filtered)	0.094	EPA's 2004 NRQWC (organism only)	0.065 J	0.078 J	0.071 J	0.1	0.25 U	0.05 U	0.05 U	0.05 U	NA
Chromium, Total	100	MCL	1.4	1.1	1.4	1.5	9.6	1.9	1.4	4.9	NA
Chromium, Dissolved (field filtered)	NA	NA	0.61	0.27 J	0.34 J	0.66	1.0 U	0.25 J	0.36 J	0.2 U	NA
Lead, Total	--	--	1.2 B	78	1.3	1.2	29	0.94	0.72	27	NA
Lead, Dissolved (field filtered)	0.54	EPA's 2004 NRQWC (organism only)	0.38	0.47	0.2	0.53	0.78	0.11	0.093 J	0.24	NA
Selenium, Total	5	--	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U	NA
Selenium, Dissolved (field filtered)	--	EPA's 2004 NRQWC (organism only)	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U	NA
Silver, Total	0.12	DEQ's 2004 AWQC (chronic)	0.05 U	0.064 J	0.13	0.05 U	0.25 U	0.09 J	0.05 U	0.05 U	NA
Silver, Dissolved (field filtered)	--	--	0.05 U	0.05 U	0.099 J	0.15	0.25 U	0.05 U	0.05 U	0.05 U	NA
Mercury, Total (7470A)	--	--	0.056 J	0.041 U	0.041 U	0.041 U	0.8	0.041 U	0.041 U	0.19 J	NA
Mercury, Dissolved (7470A, field filtered)	0.77	EPA's 2004 NRQWC (chronic)	0.041 U	0.041 U	0.041 U	0.041 U	0.3	0.041 U	0.041 U	0.041 U	NA
TPH											
Gasoline Range (NWTPH-GX)	NA	NA	27 U	10 U	27 U	27 U	10 U	27 U	27 U	NA	NA
Diesel Range (#2 C10-C24) (NWTPH-DX)	NA	NA	140 UJ	110 U	65 UJ	150 J	390 J	87 UJ	110 U	NA	NA
Motor Oil (>C24-C36) (NWTPH-DX)	NA	NA	34 U	180 U	30 U	46 J	450 J	30 U	30 U	NA	NA
PCBs^d (8082A)											
Aroclor® 1016	0.96	Tap Water PRG	0.0057 U	0.0052 U	0.0053 U	0.0047 U	0.0051 U	0.0053 U	0.0054 U	NA	NA
Aroclor® 1221	0.034	Tap Water PRG	0.0079 U	0.0072 U	0.0073 U	0.0064 U	0.007 U	0.0072 U	0.0075 U	NA	NA
Aroclor® 1232	0.034	Tap Water PRG	0.0052 U	0.0048 U	0.0048 U	0.0043 U	0.0046 U	0.0048 U	0.0049 U	NA	NA
Aroclor® 1242	0.034	Tap Water PRG	0.0052 U	0.0048 U	0.0048 U	0.0043 U	0.0046 U	0.0048 U	0.0049 U	NA	NA
Aroclor® 1248	0.034	Tap Water PRG	0.0090 U	0.0083 U	0.0083 U	0.0074 U	0.008 U	0.0083 U	0.0085 U	NA	NA
Aroclor® 1254	0.033	Oak Ridge National Laboratory's (Tier II SCV)	0.0056 U	0.0051 U	0.0052 U	0.0046 U	0.0049 U	0.0051 U	0.0053 U	NA	NA
Aroclor® 1260	0.034	Tap Water PRG	0.0050 U	0.0045 U	0.0046 U	0.0040 U	0.0044 U	0.0046 U	0.0047 U	NA	NA
Total PCBs	0.000064	Portland Harbor specific fish consumption rate	0.0090 U	0.0083 U			0.0080 U	0.0083 U	0.0085 U	NA	NA

Table 2: Stormwater Sampling Results (2009-2015)

Analyte	JSCS Screening Levels ^a		MH-SE from South MH (SW08) downstream 3/18/2015	MH-11 from Phillips88/CB44 (SW02) downstream 9/18/2014	MH-11 from HWY30-2 (SW04) downstream 3/18/2015	MH-11 from HWY30-2, Duplicate (SW05) downstream 3/18/2015	MH- HWY30-1 (SW03) upstream 9/18/2014	MH- HWY30-1 (SW11) upstream 3/18/2015	MH-HWY30- 2 (SW12) upstream 3/18/2015	CB-44 (SW13) downstream 3/18/2015	Dissolved
	Value (µg/L)	Note	Result	Result	Result	Result	Result	Result	Result	Result	Result
Phthalates (8270D)											
Butylbenzylphthalate	3.0	DEQ's 2004 AWQC (chronic)	0.18 U	0.11 UJ	0.29 U	0.38	0.6 UJ	0.32 U	0.24 U	NA	NA
Bis(2-ethylhexyl)phthalate	2.2	EPA's 2004 NRQWC (organism only)	0.88 U	1.3 UJ	3.6 J	0.85 U	3.5 UJ	1.2 J	0.73 U	NA	NA
Diethylphthalate	3.0	DEQ's 2004 AWQC (chronic)	0.056 U	0.057 UJ	0.11 J	0.055 U	0.3 UJ	0.055 U	0.082 U	NA	NA
Dimethylphthalate	3.0	DEQ's 2004 AWQC (chronic)	0.056 U	0.15 J	0.056 U	0.055 U	0.3 UJ	0.055 U	0.082 U	NA	NA
Di-n-butylphthalate	3.0	DEQ's 2004 AWQC (chronic)	0.073 U	0.074 UJ	0.072 U	0.093 U	0.39 UJ	0.12 U	0.092 U	NA	NA
Di-n-octylphthalate	3.0	DEQ's 2004 AWQC (chronic)	0.10 U	0.1 UJ	0.10 U	0.10 U	0.54 UJ	0.10 U	0.11 U	NA	NA

Notes:

Bold indicate concentrations above the JSCS screening level value

-- = no highlighted value provided in DEQ JSCS Table 3-1 (7/18/2007 Revision) Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water

AWQC = ambient water quality criteria

DEQ = Oregon Department of Environmental Quality

EPA = U.S. Environmental Protection Agency

JSCS = Joint Source Control Strategy

MCL = maximum contaminant level

NA = not applicable

NRQWC = National Recommended Water Quality Criteria

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

PRG = preliminary remediation goal

SCV = secondary chronic value

TPH = total petroleum hydrocarbon

Data Qualifiers

U = The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

UJ = Estimated and Not Detected. The analyte is considered to be not detected at the reported value, and the associated numerical value is an estimated value.

J = The associated numerical value is an estimated quantity.

^aTable 3-1 (7/18/2007 Revision) Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water

^bMethod reporting limit and method detection limit for TestAmerica Portland 8270D SIM

^cMethod reporting limit and method detection limit for TestAmerica Irvine 6020

^dMethod reporting limit and method detection limit low level 1 L to 1 mL final volume

Table 3 Soil Chemical Data

Chemical Type			TPH			SVOCs											
Chemical Name	#2 Diesel (C10-C24)	Motor Oil (>C24-C35)	1,2-Benzophenanthracene	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[a]-anthracene	Benzo[a]-pyrene	Benzo[b]fluoranthene	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Dibenz[a,h]anthracene	Fluoranthene		
JSCS Screening Level	NL	NL	NL	NL	200	300	200	845	1,050	1,450	NL	380	13,000	1,300	2,730		
Direct Contact Screening Level - Occupational or Industrial Worker	70,000	NL	NL	NL	NL	61,000,000	NL	NS	2,700	270	2700	NL	27,000	210	29,000,000		
Direct Contact Screening Level - Construction Worker	13,000	23,000	NL	NL	NL	19,000,000	NL	93,000,000	2,100	2,100	21,000	NL	210,000	NL	8,900,000		
Location ID	Depth (ft bgs)	Sample Date															
WXPA-01	2	11/12/2009	< 30"	< 60"	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	< 6.2	
WXPA-01b	8	11/12/2009	< 32	< 64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
WXPA-02	2	11/12/2009	< 30	< 60	16	< 5.9	< 5.9	< 5.9	< 5.9	6	18	14	14	6.9	8.4	< 5.9	
WXPA-02b	7	11/12/2009	< 36	< 71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
WXPA-03	2	11/12/2009	< 32	< 65	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	7	< 6.5	17	< 6.5	< 6.5	< 6.5	
WXPA-03b	8	11/12/2009	< 29	< 58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
WXPA-04	2	11/12/2009	< 27	< 53	46	< 5.1	5.9	< 5.1	< 5.1	9.9	35	32	54	39	26	5.4	
WXPA-04b	9	11/12/2009	< 33	< 66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
WXPA-05	2	11/12/2009	< 33	76	16	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	42	28	24	30	9.4	< 6.5	
WXPA-05b	8	11/12/2009	< 33	< 66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Notes:

Yellow highlight indicates surface/near-surface soil

bgs Below ground surface

Bold Detected value

JSCS Portland Harbor Joint Source Control Strategy

NL No screening level

NA Not analyzed

Green Surface/near-surface soil concentration detected above the JSCS screening level and below the occupational, industrial, or construction worker direct contact screening level (see Table 2-1).

Red Surface/near-surface soil concentration detected above the JSCS screening level and above the occupational, industrial, or construction worker direct contact screening level (see Table 2-1).

< Non-detect value at the reporting limit

Table 3 Soil Chemical Data

Chemical Type			SVOCs					Metals							
Chemical Name Unit			Fluorene ug/kg	Indeno(1,2,3-cd)pyrene ug/kg	Naphthalene ug/kg	Phenanthrene ug/kg	Pyrene ug/kg	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Lead mg/kg	Mercury mg/kg	Selenium mg/kg	Silver mg/kg
JSCS Screening Level			536	100	561	1,170	1,520	7	NL	1	111	17	0.07	2	5
Direct Contact Screening Level – Occupational or Industrial Worker			41,000,000	2,700	23,000	NL	21,000,000	7	NL	9,000	190	800	310	5,100	5,100
Direct Contact Screening Level – Construction Worker			12,000,000	21,000	560,000	NL	6,700,000	13	60,000	NL	2,600	800	93	NL	1,500
Location ID	Depth (ft bgs)	Sample Date													
WXPA-01	2	11/12/2009	< 6.2	< 6.2	< 6.2	< 6.2	6.2	3.4	130	< 0.24	23	8.7	< 0.023	< 0.61	< 0.24
WXPA-01b	8	11/12/2009	NA	NA	NA	NA	NA	8.1	140	< 0.25	17	11	< 0.024	< 0.62	< 0.25
WXPA-02	2	11/12/2009	< 5.9	< 5.9	< 5.9	10	31	2.9	100	< 0.25	18	7.2	< 0.022	< 0.63	< 0.25
WXPA-02b	7	11/12/2009	NA	NA	NA	NA	NA	4.3	150	< 0.28	17	12	< 0.028	< 0.7	< 0.28
WXPA-03	2	11/12/2009	< 6.5	8	< 6.5	< 6.5	6.5	9.5	160	< 0.28	21	13	< 0.025	< 0.69	< 0.28
WXPA-03b	8	11/12/2009	NA	NA	NA	NA	NA	4.1	120	< 0.23	14	4.4	< 0.023	< 0.57	< 0.23
WXPA-04	2	11/12/2009	< 5.1	26	7.4	31	91	2.9	99	< 0.2	12	14	< 0.021	< 0.51	< 0.2
WXPA-04b	9	11/12/2009	NA	NA	NA	NA	NA	4.5	150	< 0.26	19	7	0.51	< 0.65	< 0.26
WXPA-05	2	11/12/2009	< 6.5	23	< 6.5	7.4	39	23	140	< 0.26	19	36	< 0.025	< 0.64	< 0.26
WXPA-05b	8	11/12/2009	NA	NA	NA	NA	NA	10	160	< 0.26	17	17	< 0.025	< 0.64	< 0.26

Notes:

Yellow highlight indicates surface/near-surface soil

bgs: Below ground surface

Bold: Detected value

JSCS: Portland Harbor Joint Source Control Strategy

NL: No screening level

NA: Not analyzed

Green: Surface/near-surface soil concentration detected above the JSCS screening level and below the occupational, industrial, or construction worker direct contact screening level (see Table 2-1).

Red: Surface/near-surface soil concentration detected above the JSCS screening level and above the occupational, industrial, or construction worker direct contact screening level (see Table 2-1).

< Non-detect value at the reporting limit

Table 4. Dry Weather Storm Drain Sampling Analytical Results

Analyte	JSCS Screening Levels ²			Method Reporting Limit (µg/L) ^b	Method Detection Limit (µg/L) ^b	Sample Results					
	Value (µg/L)	Note	EPA Method			South MH (SW01)		MH-11 (SW02)		MH-HWY30-1 (SW03)	
						Result	Dilution Factor	Result	Dilution Factor	Result	Dilution Factor
PAHs ^a											
Naphthalene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
1-Methylnaphthalene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
2-Methylnaphthalene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Acenaphthylene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Acenaphthene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Fluorene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Phenanthrene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Anthracene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Fluoranthene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Pyrene	0.2	MCL	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Benzo(a)anthracene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.011	1	0.0062 U	1	0.0057 U	1
Chrysene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.013	1	0.0062 U	1	0.0057 U	1
Benzo(b)fluoranthene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.025	1	0.0062 U	1	0.0069	1
Benzo(k)fluoranthene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.0078	1	0.0062 U	1	0.0057 U	1
Benzo(a)pyrene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.016	1	0.0062 U	1	0.0057 U	1
Indeno(1,2,3-cd)pyrene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.015	1	0.0062 U	1	0.0057 U	1
Dibenz(a,h)anthracene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.005	0.005	0.0069 U	1	0.0062 U	1	0.0057 U	1
Benzo(g,h,i)perylene	0.018	EPA's 2004 NRQWC (organism only)	8270C SIM LL	0.1	0.05	0.069 U	1	0.062 U	1	0.057 U	1
Total PAHs	—	—	NA	NA	NA	0.0878	NA	0.062 U	NA	0.057 U	NA
Metals ^d											
Arsenic, Total	0.045	Tap Water PRG	6020A	0.1	0.05	63	1	1.1	1	54	5
Arsenic, Dissolved	—	—	6020A (field filtered)	0.1	0.05	11	1	0.51	1	10	5
Barium, Total	NA	NA	6020A	0.2	0.1	270	1	18	1	440	5
Barium, Dissolved	NA	NA	6020A (field	0.2	0.1	29	1	11	1	150	5

Table 4. Dry Weather Storm Drain Sampling Analytical Results

Analyte	JSCS Screening Levels ²			Method Reporting Limit (µg/L) ^b	Method Detection Limit (µg/L) ^c	Sample Results					
	Value (µg/L)	Note	EPA Method			South MH (SW01)		MH-11 (SW02)		MH-HWY30-1 (SW03)	
						Result	Dilution Factor	Result	Dilution Factor	Result	Dilution Factor
Cadmium, Total	--	--	8020A	0.1	0.05	0.75	1	0.13	1	1.6	5
Cadmium, Dissolved	0.094	EPA's 2004 NRQWC (organism only)	8020A (field filtered)	0.1	0.05	0.16	1	0.078 J	1	0.25 U	5
Chromium, Total	100	MCL	8020A	0.5	0.2	2.1	1	1.1	1	9.6	5
Chromium, Dissolved	NA	NA	8020A (field filtered)	0.5	0.2	0.44 J	1	0.27 J	1	1.0 U	5
Lead, Total	--	--	8020A	0.1	0.05	4.2	1	78	1	29	5
Lead, Dissolved	0.54	EPA's 2004 NRQWC (organism only)	8020A (field filtered)	0.1	0.05	0.85	1	0.47	1	0.78	5
Selenium, Total	--	--	8020A	0.5	0.3	0.34 J	1	0.3 U	1	1.5 U	5
Selenium, Dissolved	5	EPA's 2004 NRQWC (organism only)	8020A (field filtered)	0.5	0.3	0.3 U	1	0.3 U	1	1.5 U	5
Silver, Total	0.12	DEQ's 2004 AWQC (chronic)	8020A	0.1	0.05	0.05 U	1	0.064 J	1	0.25 U	5
Silver, Dissolved	--	--	8020A (field filtered)	0.1	0.05	0.05 U	1	0.05 U	1	0.25 U	5
Mercury, Total	--	--	7470A	0.2	0.041	0.088 U	1	0.041 U	1	0.8	1
Mercury, Dissolved	0.77	EPA's 2004 NRQWC (chronic)	7470A (field filtered)	0.2	0.041	0.041 U	1	0.041 U	1	0.3	1
TPH											
Gasoline Range	NA	NA	NWTPH-GX	50	10	10 U	1	10 U	1	10 U	1
Diesel Range (#2 C-10-C24)	NA	NA	NWTPH-DX	125 - Diesel	18 - Diesel	240 J	1	110 U	1	390 J	1
Motor Oil (>C24-C38)	NA	NA	NWTPH-DX	250 - Motor Oil	28 - Motor Oil	270 J	1	180 U	1	450 J	1
PCBs ⁹											
Aroclor® 1016	0.06	Tap Water PRG	8082A	0.05	0.0065	0.0051 U	1	0.0052 U	1	0.0051 U	1
Aroclor® 1221	0.034	Tap Water PRG	8082A	0.05	0.0068	0.007 U	1	0.0072 U	1	0.007 U	1
Aroclor® 1232	0.034	Tap Water PRG	8082A	0.05	0.0055	0.0047 U	1	0.0048 U	1	0.0046 U	1
Aroclor® 1242	0.034	Tap Water PRG	8082A	0.05	0.0078	0.0047 U	1	0.0048 U	1	0.0046 U	1
Aroclor® 1248	0.034	Tap Water PRG	8082A	0.05	0.006	0.0081 U	1	0.0083 U	1	0.008 U	1

Table 4. Dry Weather Storm Drain Sampling Analytical Results

Analyte	JSCS Screening Levels ^a			Method Reporting Limit (µg/L) ^b	Method Detection Limit (µg/L) ^c	Sample Results					
	Value (µg/L)	Note	EPA Method			South MH (SW01)		MH-11 (SW02)		MH-HWY30-1 (SW03)	
						Result	Dilution Factor	Result	Dilution Factor	Result	Dilution Factor
Aroclor® 1254	0.033	Oak Ridge National Laboratory's (Tier II SCV)	8082A	0.05	0.0079	0.005 U	1	0.0051 U	1	0.0049 U	1
Aroclor® 1260	0.034	Tap Water PRG	8082A	0.05	0.0057	0.0044 U	1	0.0045 U	1	0.0044 U	1
Total PCBs	0.000064	Portland Harbor specific fish consumption rate	8082A	--	--	0.0081 U	1	0.0083 U	1	0.0080 U	1
Phthalates											
Butylbenzyl phthalate	3.0	DEQ's 2004 AWQC (chronic)	8270D	0.6	0.2	0.17 J	1	0.11 UJ	1	0.6 UJ	5
Bis(2-ethylhexyl)phthalate	2.2	EPA's 2004 NRQWC (organism only)	8270D	3	1.18	2.1 UJ	1	1.3 UJ	1	3.5 UJ	5
Diethylphthalate	3.0	DEQ's 2004 AWQC (chronic)	8270D	0.4	0.1	0.064 UJ	1	0.057 UJ	1	0.3 UJ	5
Dimethylphthalate	3.0	DEQ's 2004 AWQC (chronic)	8270D	0.4	0.1	0.064 UJ	1	0.15 J	1	0.3 UJ	5
Di-n-butylphthalate	3.0	DEQ's 2004 AWQC (chronic)	8270D	0.4	0.13	0.083 UJ	1	0.074 UJ	1	0.39 UJ	5
Di-n-octylphthalate	3.0	DEQ's 2004 AWQC (chronic)	8270D	0.4	0.18	0.11 UJ	1	0.1 UJ	1	0.54 UJ	5

Notes:

Bold indicate concentrations above the JSCS screening level value

-- = no highlighted value provided in DEQ JSCS Table 3-1 (7/16/2007 Revision) Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water

AWQC = ambient water quality criteria

DEQ = Oregon Department of Environmental Quality

EPA = U.S. Environmental Protection Agency

JSCS = Joint Source Control Strategy

MCL = maximum contaminant level

NA = not applicable

NRQWC = National Recommended Water Quality Criteria

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

PRG = preliminary remediation goal

SCV = secondary chronic value

TPH = total petroleum hydrocarbon

Table 4. Dry Weather Storm Drain Sampling Analytical Results

Analyte	JSCS Screening Levels ³		EPA Method	Method Reporting Limit (µg/L) ^b	Method Detection Limit (µg/L) ^c	Sample Results					
						South MH (SW01)		MH-11 (SW02)		MH-HWY30-1 (SW03)	
	Value (µg/L)	Note				Result	Dilution Factor	Result	Dilution Factor	Result	Dilution Factor

Data Qualifiers

U = Result was not detected above the laboratory method reporting limit or the method detection limit

J = Result should be considered estimated

^aTable 3-1 (7/18/2007 Revision) Screening Level Values for Soil/Sediment, Stormwater, Groundwater, and Surface Water^bMethod reporting limit and method detection limit for dilution factor of 1^cMethod reporting limit and method detection limit for TestAmerica Portland 8270C SIM LL^dMethod reporting limit and method detection limit for TestAmerica Irvine 6020LL^eMethod reporting limit and method detection limit low level 1 L to 1 mL final volume